

### ABSTRACT

Methods and apparatus for desalination of salt water (and purification of polluted water) are disclosed. Saline (or otherwise polluted) water is pumped to a desalination installation and down to the base of a desalination fractionation column, where it is mixed with hydrate-forming gas or liquid to form either positively buoyant (also assisted buoyancy) or negatively buoyant hydrate. The hydrate rises or sinks or is carried into a lower pressure area and dissociates (melts) into the gas and pure water. In preferred embodiments, residual salt water which is heated by heat given off during formation of the hydrate is removed from the system to create a bias towards overall cooling as the hydrate dissociates endothermically at shallower depths, and input water is passed through regions of dissociation in heat-exchanging relationship therewith so as to be cooled sufficiently for hydrate to form at pressure-depth. The fresh water produced by the system is cold enough that it can be used to provide refrigeration, air conditioning, or other cooling; heat removed from the system with the heated residual water can be used for heating or other applications. In other embodiments, desalination or other purification is carried out in "artificially" or mechanically pressurized vessels, which embodiments may be comparatively mobile. Such pressurized systems can be used to capture carbon dioxide from industrial waste gases and to provide liquid carbon dioxide.

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